

What Is Claimed Is:

- 1 1. In a method for operating a fuel cell
2 system having a fuel processor which supplies a hydrogen-
3 rich stream to a stack of fuel cells, wherein said
4 hydrogen reacts with an oxidant to supply electrical
5 power to an external load, the improvement comprising:
6 (a) monitoring actual voltage and actual
7 current from the fuel cell stack;
8 (b) determining an expected magnitude of
9 voltage as a function of said actual
10 current based on a predetermined
11 relationship between voltage and current;
12 (c) calculating a variance value between said
13 actual voltage and said expected voltage
14 magnitudes; and
15 (d) generating a signal if said calculated
16 variance value exceeds a predetermined
17 variance value.

- 1 2. The method of claim 1 wherein before step
2 (d), establishing different predetermined variance values
3 for different loads.

- 1 3. The method of claim 1 wherein before step
2 (d), establishing different predetermined variance values
3 for different fuel cell stack operating parameters.

- 1 4. The method of claim 3 wherein said
2 different fuel cell stack operating parameters include
3 pressure, temperature, supply of said hydrogen-rich
4 stream and supply of said oxidant.

1 5. The method of claim 1 wherein said
2 predetermined relationship between voltage and current is
3 symbolized as a polarization curve and wherein different
4 predetermined variance values are established along the
5 curve.

1 6. The method of claim 1 further including
2 terminating the supply of power to the external load when
3 said predetermined variance value is exceeded.

1 7. The method of claim 1 further comprising
2 the step of establishing the predetermined variance value
3 as a percentage of the expected magnitude of the voltage.

1 8. The method of claim 7 further comprising
2 the steps of:
3 establishing a positive variance value as a
4 percentage of the predicted voltage wherein the sum of
5 percentage and the predicted voltage magnitude are
6 greater than the predicted voltage magnitude; and
7 establishing a negative variance value as a
8 percentage of the predicted voltage magnitude wherein the
9 sum of the percentage and the predicted voltage magnitude
10 is less than the predicted voltage magnitude.

1 9. The method of claim 8 further comprising
2 the step of:
3 generating separate output signals based on the
4 predicted voltage magnitude exceeding the positive and
5 the negative variance values.

1 10. In a method for operating a fuel cell
2 system having a fuel processor which supplies a hydrogen-
3 rich stream to a stack of fuel cells, wherein said
4 hydrogen reacts with an oxidant to supply electrical
5 power to an external load, the improvement comprising:

- 6 (a) establishing a predetermined relationship
- 7 between voltage and current for a fuel
- 8 cell stack;
- 9 (b) monitoring actual voltage and actual
- 10 current from the fuel cell stack;
- 11 (c) then either:
- 12 (1) determining an expected value of
- 13 voltage as a function of the actual
- 14 current based on the predetermined
- 15 relationship; or
- 16 (2) determining an expected value of
- 17 current as a function of the actual
- 18 voltage based on the predetermined
- 19 relationship;
- 20 (d) calculating the variance between said
- 21 actual and expected values; and
- 22 (e) generating a signal if the calculated
- 23 variance exceeds a predetermined variance
- 24 value.